Component of Statistics Canada Catalogue no. 82-003-X
Health Reports

Article

Weight gain during pregnancy: Adherence to Health Canada's guidelines

by Hélène Lowell and Doris C. Miller

April 2010

Statistics Canada Statistique Canada

Canada

Weight gain during pregnancy: Adherence to Health Canada's guidelines

by Hélène Lowell and Doris C. Miller

Abstract

The 2006 Maternity Experiences Survey provides information about women's weight before, during and after pregnancy. Using these data, this study assessed Canadian women's adherence to the 1999 gestational weight gain guidelines. Women with a higher pre-pregnancy body mass index were more likely than normal or underweight women to gain more than recommended. Compared with older mothers, a higher percentage of young mothers gained more than recommended. Women who gave birth for the first time were more likely than those who had had more than one birth to gain more than recommended. A lower level of education was associated with weight gain exceeding the recommendations. Aboriginal women were more likely than non-Aboriginal women to gain more than recommended. Women who gained more than recommended while they were pregnant retained more weight five to nine months post-partum, compared with those who gained less than or within the amount recommended.

Keywords

birth weight, body mass index, behaviour, body weight changes, health surveys, pregnancy outcomes

Authors

Hélène Lowell (1-613-948-4535; helene.lowell@hc-sc.gc.ca) and Doris C. Miller (1-613-948-4534; doris.miller@hc-sc.gc.ca) are with the Office of Nutrition Policy and Promotion, Health Products and Food Branch at Health Canada, Ottawa, Ontario, K1A 0K9.

Canadian women's adherence to Health Canada's gestational weight gain guidelines has not been assessed since the recommendations were released in 1999.[1] Observational studies in countries with similar guidelines have shown that women tend to gain more weight than recommended while they are pregnant.[2-5] The release of perinatal health data[6] for a representative sample of Canadian women provides an opportunity to determine if women in Canada also gain more weight than is recommended.

This article describes Canadian women's adherence to Health Canada's 1999 gestational weight gain guidelines, based on an analysis of data from the 2006 Maternity Experiences Survey (see *The data*). These guidelines for singleton pregnancies vary according to the mother's pre-pregnancy body mass index (BMI). At the time of the survey, the recommended weight gain ranges were:

- 12.5 to 18.0 kilograms for women with a pre-pregnancy BMI less than 20;
- 11.5 to 16.0 kilograms for women with a pre-pregnancy BMI of 20 to 27; and
- 7.0 to 11.5 kilograms for women with a pre-pregnancy BMI greater than 27.[1]

The ranges were adapted from the 1990 Institute of Medicine gestational weight gain recommendations,[7] which were under review at the time of the analysis.[8]

The findings are reported according to whether the gestational weight gain was below, within or above the recommendations, by selected socio-demographic and maternity characteristics of the mother: pre-pregnancy BMI; age; parity (number of times the woman had given birth, including stillbirths); education; household income; Aboriginal status; country of birth; and region of residence.

Results are also presented for two health outcomes—post-partum weight retention and infant birth weight—for the three gestational weight gain categories.

The data

The 2006 Maternity Experiences Survey collected information about the experiences during pregnancy, birth and the early post-partum months of women aged 15 or older at the time of their baby's singleton live birth in Canada during the three-month period before the 2006 Census. They had to be living with their infant at the time of the survey, which, for 96.9% of the mothers, was conducted five to nine months post-partum. Mothers living in institutions or on reserves were excluded from the survey. The survey was carried out by Statistics Canada on behalf of the Public Health Agency of Canada as an initiative of the Canadian Perinatal Surveillance System. Detailed descriptions of the survey design and methods are available in a published report.[9] The complete questionnaire is available online.[10]

A total of 6,421 women completed the survey, representing an estimated 76,508 women who gave birth during the target period, for a response rate of 78%. Only those who gave birth to a full-term baby (37 to 41 weeks' gestation) were included in this analysis; this excluded 474 women. As well, 24 women whose self-reported pre-pregnancy weight, gestational weight gain and post-pregnancy weight could not be reconciled were excluded; these were women who may have reported their pregnancy weight instead of their weight gain, or who had a large relative difference between their pre-pregnancy and post-pregnancy weights. Women with missing values for length of gestation or pre-pregnancy BMI were also excluded. A total of 5,554 women remained in the analysis.

To take account of the complex survey design, the bootstrap method [11,12] was used to estimate standard deviations, coefficients of variation and confidence intervals. The significance level was set at $p<0.05$. The Bonferroni correction[13] was used for multiple comparisons.

In addition to descriptive statistics, a separate logistic regression was performed to identify significant associations between socio-demographic/maternity characteristics (pre-pregnancy BMI, mother's age, parity, education, household income, born in Canada by Aboriginal status or born outside of Canada, and region of residence) and gaining more weight than recommended, compared with gaining within the recommendations.

The mother's *pre-pregnancy BMI* was obtained from self-reported height and weight. The mothers were also asked about their gestational weight gain and their weight at the time of interview:

- "How tall are you without shoes on?"
- "Just before your pregnancy with (your baby), how much did you weigh?"
- "How much weight did you gain during your pregnancy with (your baby)?"
- "How much do you weigh now?"

For *parity*, women were defined as either primiparous (their first live birth with no previous stillbirths), or multiparous (had previous live births or stillbirths).

The mother's *highest level of education* was categorized into four levels: less secondary, secondary graduation, some postsecondary/diploma/certificate, and university degree.[14]

The variable for *household income* was similar to a derived variable for income in the 2000/2001 (cycle 1.1) Canadian Community Health Survey,[15] based on total household income and the number of people living in the household, collapsed into three categories: lowest/lower-middle, middle, and upper-middle/highest.

Mothers were asked their *country of birth*. For those who were foreign-born, no adjustment was made for how long they had lived in Canada. Although *Aboriginal status* was asked of respondents who were born in Canada, the United States and Greenland, in this analysis, Aboriginal was defined as those who self-identified as Aboriginal and were born in Canada.

One of the main limitations of the data is that height and weight were self-reported. However, the percentage distribution of pre-preganancy BMIs among the weight classification categories[16] of women aged 18 to 50 in this analysis and that based on self-reported height and weight of non-pregnant women aged 18 to 50 in the 2005 Canadian Community Health Survey were similar[17] (5.8% versus 5.5% underweight; 60.3% versus 59.4% normal weight; 21.0% versus 22.4% overweight; and 13.0% versus 12.7% obese).[18] This similarity provides additional assurance that the findings presented here can be generalized to Canadian women of child-bearing age.

A systematic review of studies that compared directly measured with self-reported height, weight and BMI concluded that self-reported weight and BMI were underestimated, and height was overestimated.[19] Using data from the 2005 Canadian Community Survey, Shields et al[20] quantified the bias associated with self-reported height, weight and BMI. Females' average BMI was 1.2 kg/m^2 less when calculated with self-reported height and weight, compared with measured height and weight, and as weight increased so did the difference between self-reported and measured BMI. If BMI was underestimated in the 2006 Maternity Experiences Survey, some women might actually be in a higher BMI category; that is, rather than being in the "less than recommendations" group, they should be in the "within recommendations" group, or in the "more than recommendations" group rather than the "within reccommendations" group. This implies that the percentages "within recommendations" and "more than recommendations" could be underestimated for women whose pre-pregnancy BMI was 20 to 27 or more than 27.

Mothers in Nunavut, the Northwest Territories and Yukon were included in the sample, although they were interviewed nine to 14 months post-partum rather than five to nine months. As a result of the inclusion of these women, the data on average weight retention by pre-pregnancy BMI may be an underestimation of weight retention at five to nine months post-partum.

Factors that were not controlled for in the logistic regression (such as mother's height, smoking status and alcohol use)[8] may also predict gestational weight gain.

Factors associated with gestational weight gain

According to the 1990 Institute of Medicine report, a woman's pre-pregnancy weight is a primary determinant of how much weight she will gain while she is pregant.[7] Indeed, results from the Maternity Experiences Survey show that 55% of overweight women gained more than recommended while they were pregnant, compared with 41% of those who were in the normal range and 26% of those who were underweight (Figure 1). However, in addition to pre-pregnancy weight, factors such as age, parity, education and income have also been identified as potential predictors of weight gain during pregnancy.[21,22]

The percentage who gained more weight than recommended declined at older ages, from 56% of 15- to 19-year-old mothers to 35% of those aged 35 to 39 (Table 1).

Women giving birth for the first time (primiparous) were more likely than those who had previously given birth (multiparous) to gain more than recommended: 47% versus 37%. This difference persisted when other variables, including age, were taken into account. Primiparous women's adjusted odds of exceeding rather than being within the weight gain recommendations were 1.5 (95% CI of 1.3 to 1.7) times those of multiparous women (data not shown).

The likelihood of gaining more weight than recommended during pregnancy was greater among women with less than secondary education (53%), compared with those who had some postsecondary education (43%) or a university degree (38%). This difference held when other factors were taken into account. The adjusted odds that women with less than secondary education would exceed rather than be within the weight gain recommendations were 2.1 (95% CI of 1.6 to 3.0) times those of women with a university degree (data not shown).

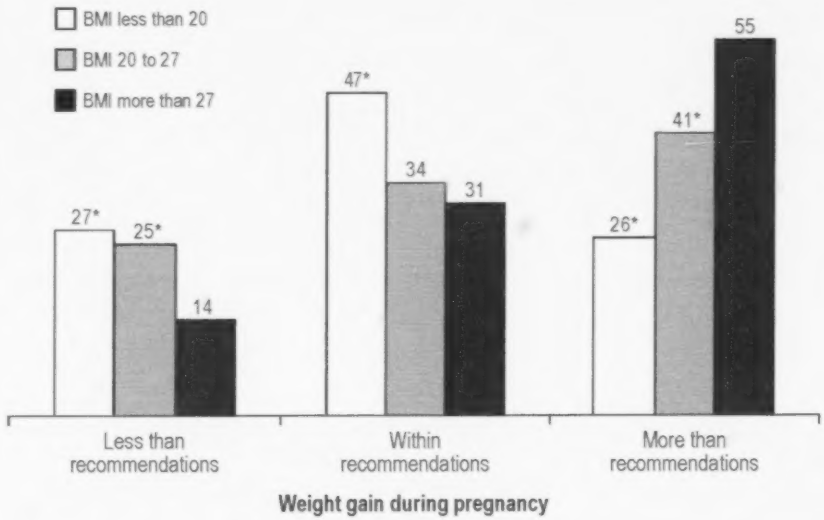
On the other hand, women with a low household income were no different from those with a high household income in terms of gaining more weight than recommended (43% versus 41%) during pregancy. However, a higher percentage of women with a low household income gained less than recommended, compared with women who had a high household income (27% versus 21%).

Women who self-identified as Aboriginal were more likely than non-Aboriginal women to gain more than recommended: 55% versus 44%. And owing to post-partum weight retention, excess weight gain during pregnancy has the potential of further exacerbating the current high prevalence of overweight and obesity among Aboriginal women[23] living off-reserve.

A higher percentage of women born in Canada (44%) gained more weight than recommended during their pregnancy, compared with women not born in Canada (33%).

Among the six regions, Ontario's percentage distribution of weight gain during pregnancy in relation to the Health Canada recommendations was very close to the distribution for Canadian women overall. And compared with Ontario, only in the Atlantic region did a significantly higher percentage of women gain more weight than recommended while they were pregnant.

Figure 1
Percentage of women who gained less than, within and more than Health Canada's gestational weight gain guidelines, by pre-pregnancy body mass index (BMI), female household population aged 15 or older who gave birth during three months before 2006 Census, Canada



* significantly different from corresponding estimate for BMI more than 27 ($p<0.05$)
Source: 2006 Maternity Experiences Survey

Gestational weight gain and health outcomes

The weight gain guidelines reflect observations of healthy pregnancy outcomes.[7] Gaining insufficient weight has been associated with low birth weight (less than 2,500 grams), while gaining too much weight has been associated with both high birth weight (more than 4,000 grams) and post-partum weight retention.[24]

According to the Maternity Experiences Survey, women who gained *less* weight than recommended when they were pregnant were more likely to have an infant weighing less than 2,500 grams than a normal weight full-term infant: 44% versus 24% (Table 2). On the other hand, the majority (58%) of women who gained *more* weight than recommended gave birth to an infant

Table 1
Percentage of women who gained less than, within and more than Health Canada's gestational weight gain guidelines, by selected characteristics, female household population aged 15 or older who gave birth during three months before 2006 Census, Canada

	Weight gain during pregnancy								
	Less than recommendations			Within recommendations			More than recommendations		
		95% confidence interval			95% confidence interval			95% confidence interval	
Characteristics	%	from	to	%	from	to	%	from	to
Age at delivery									
15 to 19	20	14	26	24*	19	30	56*	49	62
20 to 24	22	18	25	29*	25	32	50*	46	54
25 to 29	21	19	23	35	33	37	44*	41	46
30 to 34	23	21	25	38	36	41	39	37	42
35 to 39†	26	23	30	38	35	42	35	32	39
40 or older	24	17	31	40	32	49	36	28	44
Parity									
Primiparous	19*	18	21	33*	31	35	47*	45	50
Multiparous†	25	24	27	38	36	39	37	35	39
Highest level of education									
Less than secondary†	21	17	25	26	22	31	53	48	58
Secondary graduation	25	22	28	30	26	33	45	41	49
Some postsecondary/diploma/certificate	22	20	24	36*	34	38	43*	40	45
University degree	22	20	24	40*	37	42	38*	35	40
Household income									
Low†	27	23	31	30	26	34	43	39	47
Medium	23	21	24	35*	34	37	42	40	44
High	21*	19	23	38*	36	40	41	39	44
Aboriginal status									
Non-Aboriginal	21	19	22	36*	34	37	44*	42	45
Aboriginal†	16	12	20	29	23	35	55	49	61
Country of birth									
Canada	21*	19	22	35	34	37	44*	43	46
Other†	29	26	32	38	35	41	33	30	36
Region									
Canada	22	21	24	36	34	37	42	40	43
Atlantic	15	13	18	35	32	37	50*	47	53
Quebec	22	20	25	39	36	42	39	36	41
Ontario†	23	21	25	35	32	37	42	40	44
Prairies	22	20	25	34	31	37	44	41	47
British Columbia	24	20	27	35	31	39	41	37	45
Territories	29	25	33	34	29	38	37	33	42

† reference category
* significantly different from estimate for reference category ($p<0.05$)
Source: 2006 Maternity Experiences Survey

weighing 4,000 grams or more. These findings mirror results from a systematic review by Viswanathan et al.,[24] who found moderate-to-strong evidence of an association between gestational weight gains below the 1990 Institute of Medicine recommendations and low birth weight, and strong evidence to support an association between gains above the recommendations and high birth weight.

Five to nine months after they had given birth, women who gained more weight than recommended during their pregnancy retained more weight (an average of 4.5 kg) than did women who gained within or less than the recommendations (averages of 2.0 kg and 0.5 kg, respectively) (Table 3). Viswanathan et al[24] also found moderate evidence supporting an association between weight gain above the Institute of Medicine recommendations and post-partum weight retention three months to three years later.

Conclusion

Information from the 2006 Maternity Experiences Survey suggests that relatively high percentages of women who are young, primiparous, less educated or Aboriginal gain more weight than recommended while they are pregnant. ■

Table 2
Percentage of women who gained less than, within and more than Health Canada's gestational weight gain guidelines, by baby's birth weight, female household population aged 15 or older who gave birth during three months before 2006 Census, Canada

	Weight gain during pregnancy								
	Less than recommendations			Within recommendations			More than recommendations		
		95% confidence interval			95% confidence interval			95% confidence interval	
Baby's birth weight (grams)	%	from	to	%	from	to	%	from	to
Low (less than 2,500)	44*	33	55	F	...	...	F	...	...
Normal (2,500 to less than 4,000)	24*	22	25	37*	35	38	40*	38	41
High (4,000 or more)†	12	9	14	30	27	34	58	54	62

† reference category
* significantly different from estimate for reference category ($p<0.05$)
F too unreliable to be published (coefficient of variation more than 33.3%)
... not applicable
Source: 2006 Maternity Experiences Survey

Table 3
Average weight retention of women who gained less than, within and more than Health Canada's gestational weight gain guidelines, by pre-pregnancy body mass index, 5 to 9 months postpartum, female household population aged 15 or older who gave birth during three months before 2006 Census, Canada

	Weight gain during pregnancy								
	Less than recommendations			Within recommendations			More than recommendations		
	Mean weight retention	95% confidence interval		Mean weight retention	95% confidence interval		Mean weight retention	95% confidence interval	
Pre-pregnancy body mass index	(kg)	from	to	(kg)	from	to	(kg)	from	to
Total	**0.5**E	**0.2**	**0.8**	**2.0**	**1.8**	**2.3**	**4.5**	**4.3**	**4.8**
Less than 20	1.8	1.3	2.3	3.0	2.6	3.4	5.8	5.1	6.5
20 to 27	1.0†	0.6	1.3	2.2	1.9	2.5	5.0	4.7	5.3
More than 27	-3.7	-4.7	-2.6	F	...	...	3.2	2.6	3.9

E interpret with caution (coefficient of variation 16.6% to 33.3%)
F too unreliable to be published (coefficient of variation more than 33.3%)
... not applicable
Source: 2006 Maternity Experiences Survey

References

1. Health Canada. *Nutrition for a Healthy Pregnancy: National Guidelines for the Childbearing Years*. Ottawa: Minister of Public Works and Government Services Canada, 1999.
2. Schieve LA, Cogswell ME, Scanlon KS. Trends in pregnancy weight gain within and outside ranges recommended by the Institute of Medicine in a WIC population. *Maternal and Child Health Journal* 1998; 2(2): 111-6.
3. Kiel DW, Dodson EA, Artal R, et al. Gestational weight gain and pregnancy outcomes in obese women: how much is enough? *Obstetrics and Gynecology* 2007; 110(4): 752-8.
4. Lederman SA, Paxton A, Heymsfield SB, et al. Body fat and water changes during pregnancy in women with different body weight and weight gain *Obstetrics and Gynecology* 1997; 90: (4 Pt 1): 483-8.
5. Devader SR, Neeley HL, Myles TD, Leet TL. Evaluation of gestational weight gain guidelines for women with normal prepregnancy body mass index *Obstetrics and Gynecology* 2007; 110(4): 745-51.
6. Public Health Agency of Canada. 2009. *What Mothers Say: The Canadian Maternity Experiences Survey*. Available at: http://www.publichealth.gc.ca/mes. Accessed May 13, 2009.
7. Institute of Medicine. *Nutrition During Pregnancy: Part I, Weight Gain*. Washington, DC: National Academy Press, 1990.
8. Committee on the Impact of Pregnancy Weight on Maternal and Child Health, National Research Council. *Influence of Pregnancy Weight on Maternal and Child Health: Workshop Report*. Available at: http://www.nap.edu/catalog/11817.html. Accessed January 11, 2009.
9. Dzakpasu S, Kaczorowski J, Chalmers B, et al. The Canadian maternity experiences survey: design and methods. *Journal of Obstetrics and Gynaecology Canada* 2008; 30(3): 207-16.
10. Public Health Agency of Canada. *Maternity Experiences Survey: 2006 Questionnaire*. Available at: http://www.publichealth.gc.ca/mes. Accessed January 8, 2009.
11. Rao JNK, Wu CFJ, Yue K. Some recent work on resampling methods for complex surveys using replication techniques. *Survey Methodology* (Statistics Canada, Catalogue 12-001) 1992; 18(2): 209-17.
12. Rust KF, Rao JNK. Variance estimation for complex surveys using replication techniques. *Statistical Methods in Medical Research* 1996; 5(3): 281-310.
13. Miller RG. *Simultaneous Statistical Inference, Second Edition*. New York: Springer-Verlag, 1981.
14. Chalmers B, Dzakpasu S, Heaman M, Kaczorowski J. The Canadian maternity experiences survey: an overview of findings. *Journal of Obstetrics and Gynaecology Canada* 2008; 30(3): 217-28.
15. Statistics Canada. *Canadian Community Health Survey (CCHS) Cycle 1.1 Derived Variable (DV) Specifications*. Available at: http://www.statcan.gc.ca/imdb-bmdi/document/3226_D5_T9_V1-eng.pdf. Accessed January 12, 2009.
16. Health Canada. *Canadian Guidelines for Body Weight Classification in Adults*. Ottawa: Minister of Public Works and Government Services Canada, 2003.
17. Statistics Canada. *2005 (3.1) Canadian Community Health Survey*. Available at: http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SurvId=3226&SurvVer=0&InstaId=15282&InstaVer=3&SDDS=3226&lang=en&db=imdb&adm=8&dis=2. Accessed March 30, 2009.
18. Miller D. Unpublished data.
19. Connor Gorber S, Tremblay M, Moher D, Gorber B. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review. *Obesity Reviews* 2007; 8(4): 307-26.
20. Shields M, Connor Gorber S, Tremblay M. Estimates of obesity based on self-report versus direct measures. *Health Reports* (Statistics Canada, Catalogue 82-003) 2008; 19(2): 61-7.
21. Olson CM, Strawderman, MS. Modifiable behavioral factors in a biopsychosocial model predict inadequate and excessive gestational weight gain. *Journal of the American Dietetic Association* 1999; 94(4): 616-22.
22. Brawarsky P, Stotland NE, Jackson RA, et al. Pre-pregnancy and pregnancy-related factors and the risk of excessive or inadequate gestational weight gain. *International Journal of Gynaecology and Obstetrics* 2005; 91(2): 125-31. Epub October 3.
23. Garriguet D. Obesity and the eating habits of the Aboriginal population. *Health Reports* (Statistics Canada, Catalogue 82-003) 2008; 19(1): 21-35.
24. Viswanathan M, Siega-Riz AM, Moos M-K, et al. *Outcomes of Maternal Weight Gain, Evidence Report Technology Assessment No. 168*. Prepared by RTI International-University of North Carolina Evidence-based Practice Center under Contract No. 290-02-0016 (AHRQ Publication No. 08-E009) Rockville, Maryland: Agency for Healthcare Research and Quality, 2008.